PATENT ABSTRACTS OF JAPAN

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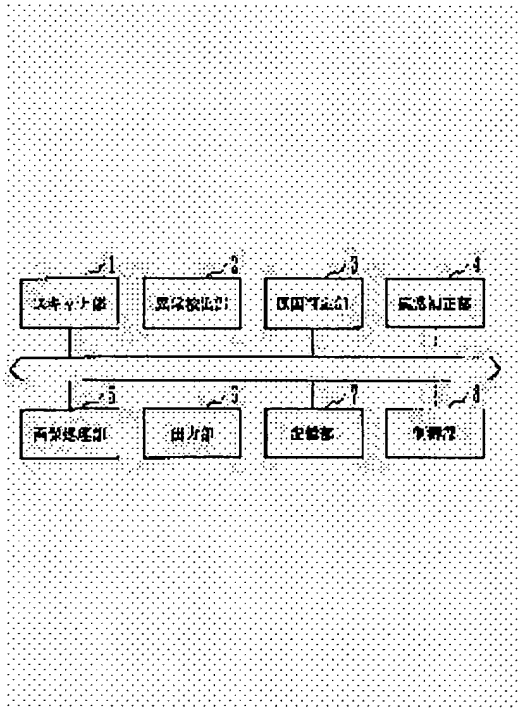
(54) IMAGE READER

(57)Abstract:

PROBLEM TO BE SOLVED: To read a high definition image by detecting an abnormal pixel in image data on a white plate, deciding whether the cause results from the white plate or something different from it against abnormal data of the detected image and correcting shading compensation or performing abnormality compensation from ambient pixel data.

SOLUTION: A storing part 7 holds data for read shading compensation on a shading compensating white plate and an abnormality detecting part 2 detects an abnormal pixel. A cause deciding part 3 decides the cause of being detected as the abnormal pixel based on read data at a front edge of an original at the time of reading the original. When the cause of the abnormal pixel is due to refuse of the white plate, the data for shading compensation which is held in the part 7 is corrected. Also, when refuse except the white plate is the cause, an abnormality compensating part 4 performs compensation of the abnormal pixel to image data after shading compensation is performed by using ambient pixel data of the abnormal pixel and an outputting part 6 outputs it.



LEGAL STATUS

[Date of request for examination]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a suitable image reader to read high-definition image data especially with respect to the image reader with which a digital copier, facsimile apparatus, an image scanner, etc. are equipped.
[0002]
[Description of the Prior Art] An image reader has photo-electric-conversion equipment and A/D-conversion equipments, such as CCD (Charged Coupled Device), can change into an electrical signal (analog) the optical information which scanned the manuscript optically and obtained it with photo-electric-conversion equipment, and can change it into M-bit image data (digital) with A/D-conversion equipment further.
[0003] In such an image reader, transform processing to image data is controlled corresponding to the light and darkness of a manuscript, illuminance change of the light source, etc. Especially, the output from photo-electric-conversion equipment is important, and the shading compensation is performed in order to amend the sensibility of this photo-electric-conversion equipment beforehand. In this shading compensation, the reference value of a shading compensation is set up based on the conversion result using this white plate using the so-called white plate. therefore, the result to which a right reference value is not acquired but an unsuitable shading compensation is carried out when the white plate is dirty -- becoming -- low -- dignified image data will be outputted.
[0004] The fault resulting from the dirt of such a white plate is coped with, and the thing of a publication is in JP,63-191760,U as a conventional technique for raising the reading engine performance in an image reader. With this technique, to a white reference plate (white plate), the light from the light source is irradiated, that reflected light is changed into an electrical signal, that electrical signal is differentiated, and adhesion of the dust on a white reference plate is detected to it. Thus, the detected dust is removed by the help and memorizes the electrical signal after this dust was removed as white reference level.
[0005] Thus, reading control based on the white reference level always set up using the white reference plate without dust can be performed, and quality image data can be obtained. However, with this technique, to the dust on a white orientation plate, although it is effective, to the dust which adhered, for example on the optical path of contact glass, a mirror, a lens, etc., etc., and the defect of the optoelectric transducer itself, it is ineffective, and has a bad influence on a setup of the reference value of a shading compensation rather.
[0006]
[Problem(s) to be Solved by the Invention] The trouble which it is going to solve is a point that the setting fault of the reference value of the shading compensation resulting from the dust which adhered on the optical path of contact glass, a mirror, a lens, etc., etc., the defect of the optoelectric transducer itself, etc. cannot be coped with, in a Prior art. The purpose of this invention is solving the technical problem of these conventional technique and offering the image reader which high-definition image data's can read.

[0007]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the image reader of this invention (1) In the image reader which performs the shading compensation using a white plate to the image data read from the manuscript as shown in drawing 1 It is based on the abnormalities/normal of the pixel in the image data of the manuscript in the malfunction detection section 2 which detects the abnormality pixel in the image data of a white plate, and the location of for example, an abnormality pixel. The cause judging section 3 which judges what the abnormality pixel detected in the malfunction detection section 2 depends on the dirt of a white plate, or the thing resulting from others, If it corrects the data for the shading compensations in an abnormality pixel location if the judgment result of this cause judging section 3 is dirt of a white plate, and it originates in others, it will be characterized by forming the abnormality amendment section 4 which amends an abnormality pixel using surrounding pixel data. Moreover, as shown in (2) drawing 3 , the return detecting element 9 which detects the change to normal from the abnormalities of the pixel in the image data of the manuscript in the location of the abnormality pixel resulting from others is formed during reading of a manuscript, and it is characterized by to suspend amendment of the abnormality pixel using the pixel data of the circumference by the abnormality amendment section 4 at the time of detection of the change to normal from the abnormalities of the pixel by this return detecting element 9. Moreover, as shown in (3) drawing 5 , the migration detecting element 10 which detects migration of the location of the abnormality pixel in the image data of the manuscript in the location of the abnormality pixel resulting from others forms during reading of a manuscript, and it is characterized by to change the object of amendment of an abnormality pixel using the pixel data of the account circumference based on the abnormality amendment section 4 based on detection of migration of the location of the abnormality pixel by this migration detecting element 10.
[0008]
[Embodiment of the Invention] Hereafter, a drawing explains the example of this invention to a detail. Drawing 1 is the block diagram showing the configuration concerning this invention of the 1st example of the image reader of this invention. The scanner section which 1 has CCD, A/D-conversion equipment, etc., reads a manuscript in this drawing 1 , and generates M-bit image data, The malfunction detection section in which 2 detects the abnormality pixel in a reading image, the cause judging section which judges the cause that 3 was detected as an abnormality pixel, The abnormality amendment section in which 4 amends an abnormality pixel using circumference pixel data, the image-processing section from which 5 changes M-bit image data into the image data of N bit, The output section to which 6 carries out the printed output of the image data of N bit, the storage section 7 remembers image data, control data, etc. to be temporarily, and 8 are control sections which control the whole equipment.
[0009] Reading is performed in the scanner section 1, the white plate for shading compensations being formed, and making a manuscript convey. In such a configuration, an image reader detects an abnormality pixel by the malfunction detection section 2 first based on the concentration of the attention pixel Rn at the time of reading of the white plate in the scanner section 1. Here, if the concentration value (M= 8, black =255, white = 0) of the attention pixel Rn when reading a white plate is set to Wn and judgment SURESSHU is set to Tw, it will detect based on the following conditional expression.
if(Wn>Tw)
Abnormality pixel elseRn[in Rn=] = normal pixel [0010] The cause judging section 3 judges whether the cause detected by the malfunction detection section 2 with the abnormality pixel is that it is the effect of the dust on a white plate, or the effect of others based on the reading data of the point at the time of reading of the conveyed manuscript. For example, if the reading concentration value (M= 8, black =255, white = 0) of manuscript tip Rhine in the location of the attention pixel Rn detected as an abnormality pixel is set to Gn and judgment SURESSHU is set to Tg, it will judge by the following conditional expression.
if(Gn<Tg)
The dust on Rn= white plate is the cause [0011] of cause elseRn= and others. Drawing 2 is a flow chart which shows the example of processing actuation concerning this invention of the image reader in

drawing 1 . First, before reading a manuscript, the white plate for shading compensations is read, and the data for shading compensations are held in the storage section 7 of drawing 1 , and an abnormality pixel is detected in the malfunction detection section 2 of drawing 1 (step 201). Next, reading of a manuscript is started and the cause detected by the cause judging section 3 of drawing 1 as an abnormality pixel based on the reading data of the point of a manuscript is judged (step 202).
[0012] When the cause of an abnormality pixel is dust of a white plate (step 203), the data for shading compensations held in the storage section 7 of drawing 1 are corrected (step 204). And a shading compensation is performed based on the corrected data for shading compensations (step 205). Moreover, when [in step 202] the causes of an abnormality pixel are dust other than a white plate as a result of a judgment (step 206), the abnormality amendment section 4 of drawing 1 amends the abnormality pixel concerned using the circumference pixel data of an abnormality pixel to the image data after performing a shading compensation based on the data for shading compensations held in the storage section 7 of drawing 1 (step 207).
[0013] Thus, the M-bit image data which amended the abnormality pixel is changed into the image data of N bit by the image-processing section 5 of drawing 1 (step 208), and this N bit image data is outputted by the output section 6 of drawing 1 (step 209).
[0014] The correction of the data for shading compensations made at step 204 sets the data for shading compensations corresponding to the attention pixel Rn to Hn, and is performed based on the following conditional expression. In addition, the data for shading compensations corresponding to circumference pixel Rn-1, Rn+1, and each for both the pixels of the location which adjoined the attention pixel Rn are set to Hn-1 and Hn+1.
if (Rn-1= normal pixel) (&(abnormality pixel in Rn=) & (Rn+1= normal pixel))
Hn'=(Hn-1+Hn+1) /2elseHn'=Hn[0015] Moreover, the amendment of an abnormality pixel performed at step 207 sets to GHnn-1 and GHn+1 the manuscript reading data after the shading compensation corresponding to circumference pixel Rn-1, Rn+1, and each for both the pixels of the location which adjoined GHn and the attention pixel Rn in the manuscript reading data after the shading compensation corresponding to the attention pixel Rn, and is performed based on the following conditional expression.

if (Rn-1= normal pixel) (&(abnormality pixel in Rn=) & (Rn+1= normal pixel))
GHn'=(GHn-1+GHn+1) /2elseGHn'=GHn[0016] In addition, by swerving, although an abnormality pixel is the example of 1-pixel width of face, the conditional expression of ** can be applied by changing the interpolation type, also when [which was shown corresponding to step 204,207] abnormality pixel width of face follows 2 pixels or more. Moreover, it is possible for performing each processing in the malfunction detection section 2 of drawing 1 based on an above-mentioned monograph affair type, the cause judging section 3, and abnormality amendment section 4 grade by the computer processing based on a program to also constitute the logical circuit corresponding to each conditional expression, and to perform it.
[0017] Next, other examples of the image reader of this invention are explained using drawing 3 and drawing 4 . Drawing 3 is the block diagram showing the configuration concerning this invention of the 2nd example of the image reader of this invention. The image reader shown in this drawing 3 has the composition of having formed the return detecting element 9, instead of the cause judging section 3 in the image reader of drawing 1 . This return detecting element 9 supervises whether the reading data of the pixel location detected as an abnormality pixel in the malfunction detection section 2 returned to normal reading data during manuscript reading.
[0018] During manuscript reading, by the return detecting element 9, if a return to the normal reading data of the reading data in an abnormality pixel location is detected, amendment in the pixel location by the abnormality amendment section 4 will be terminated. For example, if the return detecting element 9 sets to Gn the manuscript reading concentration value (M= 8, black =255, white = 0) of the attention pixel Rn detected as an abnormality pixel and judgment SURESSHU is set to Fg (>=Tg), it will judge the return to the normal pixel of an abnormality pixel based on the following conditional expression.
if(Gn>Fg)

It is [0019] to an Rn= normal pixel with the abnormality pixel in return elseRn=. Drawing 4 is a flow chart which shows the example of processing actuation concerning this invention of the image reader in drawing 3 . First, before reading a manuscript, the white plate for shading compensations is read, and the data for shading compensations are held in the storage section 7 of drawing 3 , and an abnormality pixel is detected in the malfunction detection section 2 of drawing 3 (step 401). Next, reading of a manuscript is started (step 402) and it supervises whether the pixel of the location of the abnormality pixel in the reading data of a manuscript returned to the normal pixel by the return detecting element 9 of drawing 3 (step 403).

[0020] If it is still an abnormality pixel, the amendment of the abnormality pixel using the circumference pixel data of an abnormality pixel by the abnormality amendment section 4 of drawing 3 will be continued, but if an abnormality pixel returns to a normal pixel, amendment of the abnormality pixel by the abnormality amendment section 4 of drawing 3 will not be performed (step 404). Thus, the M-bit image data which continued / suspended the amendment to an abnormality pixel is changed into the image data of N bit by the image-processing section 5 of drawing 3 (step 405), and this N bit image data is outputted by the output section 6 of drawing 3 (step 406).

[0021] Next, other examples of the image reader of this invention are explained using drawing 5 and drawing 6 . Drawing 5 is the block diagram showing the configuration concerning this invention of the 3rd example of the image reader of this invention. The image reader shown in this drawing 5 has the composition of having formed the migration detecting element 10, instead of the cause judging section 3 in the image reader of drawing 1 , and the return detecting element 9 in the image reader of drawing 3 R> 3.

[0022] This migration detecting element 10 supervises whether the abnormality pixel moved to the contiguity pixel location of right and left of the pixel location detected as an abnormality pixel in the malfunction detection section 2. When an abnormality pixel moves, the abnormality pixel location before migration is returned as a normal pixel, and the pixel of the abnormality pixel location after migration is changed as an abnormality pixel, and the pixel of this new abnormality pixel location is made applicable [in the abnormality amendment section 4] to amendment.

[0023] If the migration detecting element 10 sets to Gn the manuscript reading concentration value (M= 8, black =255, white = 0) of the attention pixel Rn detected as an abnormality pixel in the malfunction detection section 2 and judgment SURESSHU is set to TIg and FIg at this time, migration of an abnormality pixel will be judged based on the following conditional expression.

if(Gn>FIg & Gn-1<TIg)

An abnormality pixel moves to Rn-1 (an Rn= normal pixel, abnormality pixel in Rn-1=).

else if(Gn>FIg & Gn+1<TIg)

An abnormality pixel moves to Rn+1 (an Rn= normal pixel, abnormality pixel in Rn+1=).

It is [0024] with the abnormality pixel in elseRn=. Drawing 6 is a flow chart which shows the example of processing actuation concerning this invention of the image reader in drawing 5 . First, before reading a manuscript, the white plate for shading compensations is read, and the data for shading compensations are held in the storage section 7 of drawing 5 , and an abnormality pixel is detected in the malfunction detection section 2 of drawing 5 (step 601). Next, reading of a manuscript is started (step 602), and the migration detecting element 10 of drawing 5 supervises and detects whether the pixel of the location of the abnormality pixel in the reading data of a manuscript moved to the contiguity pixel location on either side (step 603).

[0025] If it is still an abnormality pixel, the amendment of the abnormality pixel using the circumference pixel data of an abnormality pixel by the abnormality amendment section 4 of drawing 5 will be continued, but if an abnormality pixel moves, amendment of the abnormality pixel by the abnormality amendment section 4 of drawing 5 will be performed to the pixel of the location of a migration place (step 604). Thus, the M-bit image data which performed amendment to the abnormality pixel of the original location or a migration place location is changed into the image data of N bit by the image-processing section 5 of drawing 5 (step 605), and this N bit image data is outputted by the output section 6 of drawing 5 (step 606).

[0026] As mentioned above, as explained using drawing 1 - drawing 6 , in the image reader of this example, the dust detected when a white plate was read judges the dust on a white plate, and the other dust, and performs abnormality pixel amendment by the optimal approach for each. This can perform effective abnormality pixel amendment also to the dust which adhered on the optical path of not only a white plate but contact glass, a mirror, a lens, etc., etc., or the defect of an optoelectric transducer.
[0027] Moreover, adhesion of the dust on the optical path of contact glass, a mirror, a lens, etc., etc. is detected, when the dust which adhered on these optical paths disappeared or moves during manuscript reading, that is detected and the object of a halt or abnormality pixel amendment is made to change abnormality pixel amendment also during manuscript reading. Degradation of the image quality by the abnormality pixel amendment accompanying disappearance and migration of the dust which adhered on the optical path is avoidable with this.
[0028] In addition, this invention is not limited to the example explained using drawing 1 - drawing 6 , and can be variously changed in the range which does not deviate from the summary. For example, although considered as the configuration which formed the output sections 6, such as a printer, in this example, it is applicable to the facsimile apparatus which has scanner equipment without a printer style, or the output section 6, and possesses a communication device.
[0029] Moreover, although the image reader which performs image reading was made into the example in this example, making a manuscript convey, it is also possible to apply to the image reader which a manuscript is fixed [reader] and makes optical system scan. Furthermore, although each of the cause judging section 3, the return detecting element 9, and the migration detecting element 10 is made into the equipment configuration prepared separately in this example as shown in drawing 1 , drawing 3 , and drawing 5 , it is also possible to consider as the configuration which combined them with arbitration.
[0030]
[Effect of the Invention] Since according to this invention a shading compensation is not performed but it amends by the adjoining normal pixel to the defect of the dust which adhered on the optical path of mirrors, lenses, etc. other than the dust on a white plate (for example, contact glass), or the optoelectric transducer itself, the bad influence of the shading compensation by these dirt etc. can be avoided, and reading of high-definition image data becomes possible.

[Translation done.]